

Developing Computer

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1 **Developing Computer Assisted Learning Media for Environment Education in Adiwiyata Elementary School**

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Abstract

This research aims to:

- 1 (1) identify systematic steps in developing computer assisted learning media for environment education in Adiwiyata elementary school,
- (2) know user (teacher and student) responds on visual aspect of the developed learning media,
- (3) know user (teacher and student) responds on learning aspect of the developed media,
- (4) know user (teacher and student) responds on content aspect of the developed media, and
- (5) examine the effectiveness of computer-assisted learning media PLH developed.

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This research is a research and development of computer assisted learning media for environment education in Adiwiyata elementary school that centered in Tanggul Patompo II Elementary School Makassar. The resulted product has been validated by media, content and programming experts. Test of the developed media has been conducted in limited test and field test. The results of this research is:

- 1 (1) Several systematic steps in developing computer assisted learning media for environment education in Adiwiyata elementary school that preceded by initial study in the form of need analysis that conducted in several Adiwiyata elementary schools. The next step is learning media and learning plan design stage. This stage was preceded by studying the syllabi, learning plan, learning material, student's worksheet and followed by evaluation process that concluded by designing the learning media. The third step is development stages. In this stage, learning media has been developed based on designed media in previous stage. The resulted media is an initial prototype product which has been validated by media, content and programming experts.

Some improvements have been done according to expert's suggestion. The last stage is trial step to some respondents that carried out in two stages that are in limited and field groups. Correctness has also been performed if there were some weaknesses found during tests.,

- (2) User (teachers and students) feedback about visual aspect of the developed media are in very good criteria,
- (3) User (teachers and students) feedback on learning aspect of the developed media are in very good criteria,
- (4) User (teachers and students) feedback on content/material aspect of the developed media are in very good criteria,
- (5) the effectivity of the developed media reached 76% in content about forest types,
- (6) The environment education learning media has been stated as valid media by two media experts, two content experts and two programming experts, and
- (7) this developed environment learning media has also complied with practical aspect that it was easily used by teachers and students.

Keywords: Learning Media, Computer Assisted Instruction, Environment Education

INTRODUCTION

The main problem in population and environmental study is the lack in people's attitude to have concern for their environment. In fact, there is even a tendency to ruin it. People tend to have more control on environment for the sake of their needs. This reason leads them to excessively explore the nature but rarely accompanied by rehabilitation measures. This irresponsible action in some ways may lead to declining in environmental quality especially in managing natural resources. Damage to the environment is characterized by a change in the environment that becomes a reality in term of the occurrence of several disasters.

Moreover, the advances in technology have also been believed to have contributed in the damage done to the environment. Technology lighters causing forest fires, cutting machine technology causes deforestation acreage breadth only a short time resulting in droughts, floods, erosion and landslides. Agricultural technology products such as fertilizers and poisons (pesticides, insecticides and herbicides) caused pollution of water and soil. Transport technology (motor vehicles) and industrial air pollution causes respiratory problems. The attitude of some people who throw garbage carelessly especially in canals or rivers may cause flooding and various diseases. Various technologies uses chemicals such as CO₂, NO, CH₄, and CFCs cause ozone layer becoming thinner and broken, resulting in global warming problem, the greenhouse effect and sea level rise. All of these cause loss of property, and even the people death.

To overcome all of the damages, efforts are needed to increase public awareness of the importance of preserving the environment. One way of doing this is through education, especially at primary school level.

Ihsan (2011) suggested that the school as an educational institution aimed at educating and instilling positive cultures should have a strategic function in changing the paradigm of thinking from generation to generation especially those incorrect thought on how to treat the nature.. While Hergenbahn and Olson (2010) explained that most human behavior is formed through a process of learning. In order to change the paradigm of human thinking to concern more about the nature, it can be done through education.

Susanto (2013) suggested that elementary school as a basic education should serve as laying the foundations of science and help to optimize the development of children through supervisory teacher learning. One of best school types is the Adiwiyata elementary schools, which featured as elementary school based environment. Asaad et al (2011) defined Adiwiyata as a good place and ideal to acquire a variety of knowledge, norms, and ethics which can be the basis for the creation of human well-being and the ideals of sustainable development.

In Makassar, there are three Adiwiyata elementary schools namely Adiwiyata Pertiwi, Adiwiyata Balang Baru I and Adiwiyata Tanggul Patompo II. Based on interviews with Nurhaeni, Subject Teacher of Environment study in grade 5 in Adiwiyata Tanggul Patompo II, she mentioned that:

- (1) Environmental study monolithically taught in grade 1 to grade 6 and is integrated in all other subjects,
- (2) 80% of the learning process is done in the classroom and the rest 20% is outside the class,
- (3) Criteria for Minimal completeness of this subject is about 75,
- (4) the study results showed that there were only 21.88% of students in cognitive aspects who complete,
- (5) aspect affective was still lacking,
- (6) psychomotor aspect was generally good although they did not understand what exactly they were doing,
- (7) instructional media used is a white board and occasionally LCD.

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Based on the above description, this research will focus on developing computer-aided learning media for environmental subject in Adiwiyata elementary school.

² **RESEARCH METHODS**

This study uses a research and development of education approach. The research was conducted from May 18th until August 31st of 2015 and was held at three Adiwiyata Schools. They are Adiwiyata Pertiwi, Adiwiyata Balang Baru I and Adiwiyata Tanggul Patompo II. These schools received awards as National Adiwiyata schools in 2013. Adiwiyata Pertiwi Elementary School is the first place to do trial test of the media with 10 students which selected randomly. Elementary School had been chosen as a field test schools with two classes. The first class is class VA with 31 students

and class VB 33 students. Subjects were Environment subjects teachers and students in grades 5 in both schools.

The instructional media were developed by referring to ASSURE models and its procedures follow the stages of 4D development. According Smaldino et al (2012), the development of ASSURE instructional model shows that a good learning systems must meet are at least 6 steps, namely:

- (1) analyze the students;
- (2) state the standards and learning objectives to be achieved;
- (3) select a strategy, technology, media and appropriate learning materials;
- (4) use the technology, media and learning materials;
- (5) require the active participation of studentss; and
- (6) evaluate and revise learning.

Meanwhile, the stages in the 4D model follow the all steps suggested by Thiagarajan, Semmel, and Semmel (1974), which consists of four stages of development:

- (1) Define;
- (2) Design,
- (3) Develop, and
- (4) Disseminate.

The content of developed learning media included:

- (1) recycling of waste,
- (2) water pollution,
- (3) air pollution and forest types.

RESULTS AND DISCUSSION

Based on research that has been conducted in several Adiwiyata elementary schools, namely, Balang Baru I, Adiwiyata Pertiwi, and Tanggul Patompo II Makassar, several results can be described as follows:

1. The learning processes of environmental subject were implemented monolithic from class I to class VI. In some other subjects, such as Indonesian, science, social studies, environment content was integrated in learning process.
2. Teachers who responsible for environmental subjects have no background of the subject, but they are several times following the activities related to environmental study.
3. This school uses the Unit Level Curriculum 2006. They used the 2013 curriculum for one semester, i.e the second semester of 2014-2015 school year, but due to the instruction of the Minister of Education and Culture No. 179 342 / MPK / KR / 2014 dated December 5, 2014, some schools were instructed to return to the previous curriculum so that the school is re-using.
4. The number of classes V in Adiwiyata Pertiwi Elementary School are three classes, whereas in Balang Elementary School, Tanggul Patompo II Elementary School is two classes. In Adiwiyata Pertiwi, each study group

consisted of 30 students, whereas in Tanggul Patompo II, there are two classes VA and VB which have 31 students and 33 students respectively.

5. The used syllabus referred to the SK-KD in the environment textbook Class V entitled Education Environment: for class V by Susriyati Mahanal et al. by editor Mardi Wiyono and Sutrisno. The book was published by the Environmental Research Center, State University of Malang collaborated with the Environmental Agency of East Java Province, in 2009.
6. The learning plan (*Rencana Pokok Pengajaran-RPP*) in Tanggul Patompo II Elementary School was complete, whereas in Adiwiy Elementary School have not yet completed.
7. The *LKPD* already exists, but is not yet completed for each meeting, so that in the learning process teachers often do not use their *LKPD*.
8. The learning material which related to garbage generally only implemented *recycle concept*, while *reuse* dan *reduse* seldom put into material.
9. Instructional media used in the classroom was still in the form of whiteboard, occasionally the teachers used MS-Power Point application and outside the classroom, they adjusted the media to learning material.
10. The learning methods used in the classroom are lectures, assignments, questions-answers and discussion.
11. The evaluation was done after each chapter of the lessons finished and it was not based on basic competence or meeting, so that the learning objectives was not known to be achieved or not.
12. Minimum criteria for completeness for environmental subject was set to be 75 for a class V in Tanggul Patompo II, whereas in other school, Adiwiyata Pertiwi, was 70. These criteria were determined by three elements, namely complexity, carrying capacity, and student intake.
13. The results of the cognitive aspects of learning for students in Tanggul Patompo II were only about 21.88% (14 of 64 students) completed, while in the affective aspect, it is still very poor. The results of psychomotor aspects generally were good although they do not understand what exactly they do. It means that they just accomplish a given task from their teacher without understanding the aim of each learning task.

Next, it is a development stage of the environment computer-assisted learning media. The learning media was developed by using application software wampserver 2 web-based version. This application was chosen so that this learning media can still be used if there is a school computer facilities and internet support. Scripts was written with notepad ++ software. This media was run via *localhost wampserver*. The structural design of environment computer assisted learning media can be seen in Figure 1

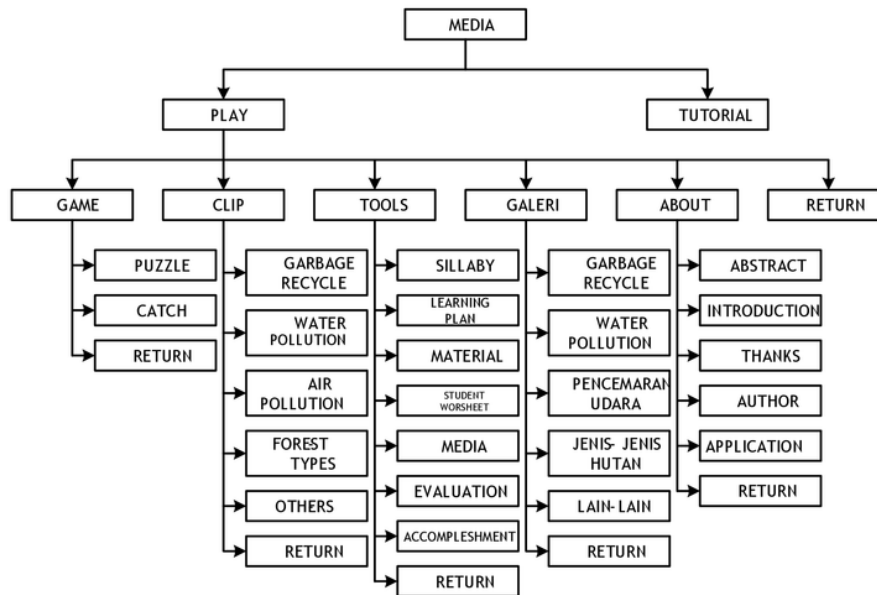


Figure 1: Structure of the Design of Media

Furthermore, the developed media have been validated for its media, learning content and programming aspects. Each is represented by two experts. Validation of media covers the aspects of appearance and learning. The display consists of 10 items of the instrument, namely:

- 1) Accuracy in selecting letters in the text,
- 2) Accuracy in selecting images,
- 3) Compatibility of the background color to the color of the text,
- 4) Accuracy of selecting the musical accompaniment,
- 5) Accuracy of visualize material,
- 6) Display of opening design,
- 7) Accuracy of animated image,
- 8) visual display,
- 9) Display of simulation, and
- 10) Clarity of navigation buttons.

Aspects of learning consists of 8 items, namely:

- 1) Easy to install,
- 2) to run properly,
- 3) Easy to use and simple to operate,
- 4) Accuracy in choosing software for the development,
- 5) Ease of interaction with the media,
- 6) Clarity instructions for use,

- 7) Clarity in selected menu, and
- 8) easy operation of simulation.

Validation of learning content includes content and instructional material aspects.

Aspects of the content / materials include:

- 1) Compliance with the purpose of learning,
- 2) Accuracy in selecting the material,
- 3) The adequacy of the material to achieve the learning objectives,
- 4) The depth of the presented material,
- 5) The sequence of material according to subject,
- 6) systematic of examples presented,
- 7) Clarity of language in materials,
- 8) Clarity of animation in explaining the subject,
- 9) clarity of the images in explaining the subject,
- 10) The relevance of visual with the subject,
- 11) Suitability of exercises with the material, and
- 12) Compliance of evaluation questions and material.

Learning aspects include:

- 1) The purpose of learning in the lesson plans are consistent with the goals in media,
- 2) The suitability of core competencies with basic competencies,
- 3) The compliance of indicators with basic competence,
- 4) Clarity of objectives to be achieved,
- 5) The order of learning is clear and easy to follow,
- 6) There are exercises on each subject,
- 7) the level of interactivity of students with multimedia,
- 8) The clarity of instruction to answer questions in each test,
- 9) The balance of number of problems in test with the number of materials, and
- 10) the precision of language in describing the material.

Programming experts validates media with 18 items within instruments include:

- 1) Easy to be installed,
- 2) to run properly,
- 3) Easy to use and simple to operate,
- 4) No error at run time,
- 5) The availability of installation instructions,
- 6) The availability of handbook,
- 7) the accuracy of selecting the software for the development,
- 8) Ease of interaction with the media,
- 9) Clarity instructions for use,
- 10) Easy to use button,
- 11) Clarity in selecting menu,
- 12) Games display,
- 13) the clarity of the image,

- 14) The size of pictures,
- 15) clarity of the images,
- 16) Simulation is easy to be operated,
- 17) Clarity of navigation buttons, and
- 18) the compliance of navigation buttons according to function.

The results of the validation of learning media can be seen in Table 1.

Table 1: Summary of validation of the environment computer-assisted learning media

Aspects	Validator 1	Validator 2	Mean	Category
Media	4.50	4.63	4.56	Very Good
Content/Learning material	4.58	4.67	4.57	Very Good
Programming	4.67	4.72	4.69	Very Good

Based on Table 1, we can conclude that the developed environment computer-assisted learning media is valid and suitable to be used.

After learning media was fixed based on suggestions from each validator, trial on limited focus group was conducted and it was attended by 10 students of grade V Adiwiyata Pertiwi which was selected randomly. Then it was followed by field trials conducted in Tanggul Patompo II, followed by as many as 31 students of class VA and VB class as much as 33 pupils. In both of these trials, the results obtained both teachers and students perceptions and student learning outcomes in using the developed media. The results of these trials can be described as follows:

1. The Perceptions of Teachers and Students

Perception of teachers and students at both trials generally are in the very good category. For more details, a summary of the perception of teachers and students can be seen in Table 2 and 3.

Table 2. Summary of Perceptions of Teachers and Students on Learning Media in Adiwiyata Pertiwi During Limited Focus Group Trial

Subject of Research	Display Aspect	Learning Aspect	Content Aspect	Mean	Category
Teachers	4.60	4.50	4.70	4.60	Very Good
Students	4.60	4.50	4.60	4.57	Very Good

Table 3. Summary of Perceptions of Teachers and Students on Learning Media in Tanggul Patompo During Field Trial

Subject of Research	Display Aspect	Learning Aspect	Content Aspect	Mean	Category
Teachers	4.60	4.50	4.70	4.60	Very Good
Students	4.60	4.50	4.60	4.57	Very Good

Based on Table 2 and 3, it can be concluded that the perception of teachers and students in both limited group and the field trials, both visual and the material aspects are in the very good category, so it can be said that the media which has been developed can be read properly by teachers and students. Readability of media is very important because the media is a means or device that serves as an intermediary in the process of communication between the source and the recipient or in the process of learning between teachers and students as a source as receiver. Rusman (2012) suggested that learning media have functions that are very strategic in learning, because it can clarify, simplify, and accelerate the delivery of the learning material to the students, so that the main core of learning material may be submitted entirely. Similarly, students can learn independently according to their talents and abilities of visual, auditory, and kinesthetic. Rusman also argued that the media can also serve as a game in order to arouse attention, passion to learn, and student motivation in learning. Learning media can provide assistance in the understanding of students who lack the skills to hear or see or less concentration of study. While Arsyad (2013) suggested that the media is a tool to achieve an effective teaching and learning situation and reduce verbalism.

These findings were similar with those of Mappalotteng (2011) who found that the responses of students to computer-assisted learning strategies such as tutorials, drill & Practice, games, Problem Solving, Simulation and Testing is very good. The same thing was found by Parenrengi (2015) that the student responses to the instructional strategy in learning motorbike technique by using computer are very good.

2. Student Learning Outcomes

Student learning outcomes are a result of the evaluation given to students after each lesson, except the pre-test given in general (4 items) before the learning begins. The summaries can be seen in Tables 4 and 5.

Table 4. Summary of Students Learning Outcomes in Adiwiyata Pertiwi During Limited Focus Group Trial

DESCRIPTION	PRE-TEST	GR	WP	AP	FT	Mean
The number of Students	10	10	10	10	10	10
Mean of students learning outcomes	65	75	74	79	76	76
The number of accomplished students	3	4	4	6	7	5
Percentage of Accomplishment (%)	30	40	40	60	70	50

Table 5. Summary of Students Learning Outcomes in Tanggul Patompo II During Field Trial

Class	Description	PRE-TEST	GR	WP	AP	FT	Mean
VA	The number of students	26	26	28	26	25	28
	Mean of students learning outcome	68.27	79.58	78.21	77.69	78.56	78.10
	The number of accomplished students	9	17	18	17	19	17
	Percentage of Accomplishment (%)	34.62	65.38	64.29	65.38	76.00	60.71

VB	The number of students	25	24	25	24	23	26
	Mean of students learning outcome	49	72	76	78	76	74
	The number of accomplished students	2	12	15	15	16	14
	Percentage of Accomplishment (%)	8.00	50.00	60.00	62.50	69.57	53.85

Note:

GR : Learning Material of Garbage Recycling

WP : Learning Material of Water Pollution

AP : Learning Material of Air Pollution

FT : Learning Material of Forest Types

Based on Table 4, it can be summed up as follows:

1. Classically, only pre-test results that do not reach a minimum accomplishment value (the value of accomplishment for environment study in Adiwiyata Pertiwi is about 70).
2. Individually, the learning material of Forest Types reached 70% of accomplishment. This means that the students who reached the value were simply too high.

Based on Table 5, it can be summed up as follows:

1. Classically, for the class VA, only pre-test results that do not reach a minimum accomplishment value (the value of accomplishment for environment study in class V SDN Tanggul Patompo II is 75). For class VB, the accomplished material is Water Pollution, Air Pollution and Forest Types.
2. Individually, the learning material of Forest Types reached 76% completion for class VA and 69.57% for class VB.

CONCLUSION

If the conclusion were looked closely that the learning material of forest types reached the highest accomplishment values. This is understandable because this is the last material taught, so students already know how to use the media to make it more effective.

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